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PROSPECTUS

YEARBOOK OF AGRICULTURE 1957

SOIL MANAGEMENT

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U. S. DEPARTMENT OF AGRICULTURE

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YEARBOOK OF AGRICULTURE 1957

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PURPOSE

Our aim is to explain the principles of soil management and their application for efficient and lasting systems of soil use. We write for farm people, people who serve farmers, and other people who are interested in developing and keeping a sound, permanently healthy agriculture.

Our farm production and the conservation of soil resources reflect the millions of decisions that are made on the individual farms. We want to help farm people make wise decisions as to the use and management of their soils. We want also to help others understand the nature and significance of those decisions and the conditions under which farmers decide on a course that will be in their best interest and in the best interest of all the people.

As commonly used, "soil management" refers to the preparation and treatment of soils for the production of crops, grasses, and trees. For nearly all field and horticultural crops, considerable manipulation of the soil is required, and varying degrees of manipulation or treatment are required for the economic, sustained production of many other plants as well.

Through research and experience, combinations of practices are developed and tested for specific kinds of soil to establish their effects on yield and quality of plants and on the long-time productivity of the soils. Good soil management includes the combinations of tillage practices and other treatments used to develop, improve, and maintain conditions suitable for producing plants on a sustained basis. Ideally, combinations of practices are used that maintain an abundant and balanced supply of nutrients, air, and water for the plants to be grown and that maintain or improve the fertility and tilth of the soil for subsequent crops.

The term "soil management," as used by many, may overlap several other terms, including "land management," "crop or plant management," and "soil conservation."

Generally, the term "land management," is considerably broader than soil management and refers to the economic use and management of all the land resources of an operating unit, such as a farm, a ranch, or a forest, which may be composed of several contrasting kinds of soil that are differently managed. "Land management" connotes the economics of production, while soil management is commonly limited to the physical practices and their physical results. "Crop or plant management" refers mainly to the selection of plant varieties, plant spacing, methods of propagation, protection, harvesting, and local processing of farm crops or other plants. Some of the practices included under any one of these terms may be relevant to one or both of the others.

"Soil conservation" includes the whole system of soil use and management practices that gives efficient, abundant, and sustained production, according to the specific patterns of soil and water resources of the individual farms, ranches, forests, and other land management units.

It implies continued efficient use and stability of each soil area that is needed for use at its best level of developed productivity. It may be said that all soil management practices come within soil conservation as thus defined, but soil conservation also includes engineering practices, such as dams and stream stabilization, and other land management practices requiring cooperation among two or more land operators that are not normally considered a part of soil management. Soil management practices and recommendations are related to specific kinds of soil, or to groups of similar soils; while some additional practices and recommendations for soil conservation are related to combinations of unlike kinds of soils in situations where practices used on an area of one kind of soil affect the sustained use of areas of other kinds of soil.

NOTES FOR WRITERS

Nearly 300,000 copies of the Yearbook are printed. The book has an estimated million readers. No other publication has the same number and type of readers or offers such an opportunity to a scientist to announce his findings and discuss his work. The importance of the publication and our subject demands the fulfillment of several obligations and standards in writing, preparation of manuscript, attitude toward the assignment, promptness in submitting contributions and returning proofs, and fairness to all persons and colleagues. The contributor should bear in mind that the Yearbook is a cooperative venture of the Department of Agriculture, not of one bureau.

1. Our readers include farmers; city dwellers and others who have no prior interest in our subject but whose interest might be attracted; high school students; businessmen, economists, teachers, Government officials, and others, who need reference material; housewives; college students; county agents; Congressmen; writers. Among our many readers are only a few bureau chiefs, graduate students, and learned doctors, but they appreciate clear writing and useful information as much as high school students do.

2. Authors should allow ample time before the time their manuscripts are due for the customary bureau clearance. The editor assumes that when a manuscript is submitted to him it is technically accurate and fully approved.

<u>The deadline for receipt of all manuscripts by the editor is May 30, 1956.</u> Manuscripts received after that date will be returned unread. Anyone who has a reservation about meeting that deadline should not accept the invitation to contribute a chapter.

3. We do not specify the exact length of the articles. A rough average length would be 5,000 words, about 25 typed pages. But the writer should use all the words he needs to discuss his subject completely, clearly, and interestingly. No one needs to resort to terms like 'Space does not permit me to...' Space, however, is always at a premium; do not overwrite.

A SPECIAL WARNING: Writers should note that some chapters listed herein (e. g., chapters 41 - 47) might be treated in Water, the 1955 Yearbook. Writers that consult that Yearbook before writing their present articles; it will not do to present the same material again - if the writer does not have additional information or cannot present a fresh viewpoint (with the emphasis on soil management) it will be best to drop the chapter in question from this outline.

Make every word count. Do not waste space on a long introduction. Long sentences are not bad in themselves, but they often indicate redundancy. Avoid summaries that merely repeat earlier material. Organize your material outline your article first, know beforehand what you are going to say; then say it. Get a logical train of thought and follow it. Rework your manuscript several times, asking yourself each time: Is this clear? Is it terse? If your outline is good, there is seldom a need to backtrack (e.g., "as was pointed out in the foregoing paragraph"). Avoid verbosity in favor of the simple, direct English, e.g.,"soon" for "in the near future," "We learned" for "on the basis of a series of experiments it was demonstrated that...;" "in summer" instead of (during the warm summer months, and many more). Try to avoid, as space wasters, passive verbs. Good paragraphing, so that one discusses only one clearly identified point at a time, saves words. So do strong, active verbs,(e. g., "one can assume" instead of "it would seem possible one could make the assumption that.")

4. Some suggestions about choice of words:

Avoid dangling participles (e. g., "Applying pressure to such infected berries, the skin slips away..."should be "Applying pressure, one causes the skin..."). Avoid beginning sentences with this or these when the antecedent is indefinite and remote. Do not overwork since when because or as can be used. Due to requires a definite noun: "The failure was due to lack of study. Avoid clauses like, "Many investigations showed that..." Giving the fact itself on your own responsibility is better. Under Florida conditions and similar phrases are jargon. Problems is overworked. Watch parallel constructions--e. g., "The lesion was brown, sunken, and on the branches should be ".....brown, sunken, and persistent for a third adjective) ...."That and which often involve meaning, not merely style. Avoid using nouns as adjectives -- a common practice that makes for heavy writing. Certain could better be some or a more precise term -- at certain intervals: every 3 or 4 days; certain workers: some workers. Areas often is loosely used for districts, counties, localities, States, regions.

Define unusual terms the first time they are used by synonyms in parentheses or within commas or, even better, as a part of the next sentence.

Avoid abbreviations in the text.

Avoid prepositional phrases at the beginnings of sentences. "The study began in Florida in 1913..." instead of, "In 1913, a study was started..."

Avoid phrases like "last year," "recently," "a few years ago." Be specific as to year; remember this volume will appear in 1957, but will be in circulation much longer than that. Consequently a term like "this spring" is meaningless.

Avoid saying in the text, "Brown's findings were..." or "Smith and Jones disproved the theory..." Instead, gain accuracy and completeness by a phrase like "Lyle P. Brown, in experiments at the Alabama Agricultural Experiment Station, found that ....."

5. The introduction and conclusion require extra thought. The introduction, the vital paragraph that determines whether the reader will continue reading your article or whether, so to speak, all your effort will be wasted, might well be a short statement of one challenging fact. A good device is a one-sentence paragraph so compact that it requires no internal punctuation. The introduction, besides attracting the reader, lays the groundwork for what follows. Usually questions do not make good introductions. A narrative flavor is good. Avoid like the plague long, historical introductions; they are dull, overworked, and usually not pertinent to the main point of the article. It's much better to jump immediately into the article.

We do not use "learned journal" summaries; they waste space. They are unnecessary if the article is properly written. Experienced writers save out a particularly good fact from the main body for use in the conclusion -- a fact that grows out of the text, looks forward, summarizes the main thought succinctly, and leaves a good feeling with the reader. Try for a pointed, crisp conclusion.

6. Material submitted for publication in the Yearbook must not be published or offered for publication elsewhere before it is printed in the Yearbook or is rejected by the editor. Please do not give your manuscript to another publisher or writer as background, or ask the editor if you may do so.

7. The Yearbook Committee plans the scope, content, and structure of the volume and advises the editor on problems of technical accuracy, suitability, and completeness. Problems of writing, presentation, duplication, illustration, and such are handled directly by author and editor after an article is submitted, not through a Committee Member or bureau official, although the editor usually keeps them informed of such details. There must always be the possibility of direct exchange between author and editor. Proofs particularly must be returned directly and expeditiously. All manuscripts are subject to revision by the editor. Usually they are returned to the authors before publication for comments, approval, additions (to keep them up-to-date), and corrections. Changes, however

extensive are always subject to the author's full, if not enthusiastic, approval. Changes are made primarily to remove duplication and repetition, eliminate wordiness and similar faults, enhance readability, and remove phrases, terms, examples, and such that are not objectionable in themselves but may be used in too many articles.

8. Contributors and other interested persons are invited to submit to Committee Members suggestions for papers not listed in this Prospectus, which is not offered as a final, static document. We want our book to be up-to-date, fresh, and living--and different, not a rehash of old material.

9. Because the actual printing takes at least 6 months and the editing up to 6 months more, as much as a year elapses between the writing of an article and the appearance of the Yearbook. Authors, therefore, should follow through on their manuscripts and be sure that in each of its steps it remains accurate and up-to-date as of that particular date.

10. This Prospectus is not a secret or restricted document, but a great deal of effort is saved if each person to whom it is sent will remember that it is for his own use only and not for wide discussion or announcement.

11. Entries in this outline are topics, not necessarily the titles of the articles. Titles that authors use on their manuscripts should be short, accurate, and attractive. Changes may be made in them to conform to typographic style yet to be chosen or for reasons of succinctness and directness.

12. Subheads will follow the practice of the 1952, 1953, and 1954 Yearbooks. They are merely a line of space; the two or three key words that begin the next line are set in small capitals. The device saves up to 30 pages in the book and improves the appearance, particularly because of our narrow columns. Do not, therefore, use subheads as such in your manuscript. Subheads cannot be a substitute for good organization of thought and proper transition.

13. Avoid footnotes.

14. Publications may be mentioned in the text with the full name of the author and the work. We do not cite literature by numbers in parentheses in the text. For a general bibliography, authors may submit (on separate sheets) a list of major contributions bearing on his topic; these should give titles, authors, and other data accurately and without abbreviations.

15. Charts, line drawings, and black-and-white photographs of professional quality are welcome. We cannot use color photographs this year. Do not send negatives of photographs. Pack and label the pictures carefully. All

precautions are taken, but the editor assumes no responsibility for the return of photographs or other art work. Submit no pictures that cannot become the property of the editor. Probably most authors can arrange for the services of skilled photographers in their institutions. If that is not possible, we suggest they write to the editor or to the chairman of the Yearbook Committee. It may be possible to arrange for some photographs through agencies of the Department. In all useful photographs the subject stands out clearly with the minimum of other subjects that distract from the one being illustrated. Each needs a clear caption with date and location. For field pictures the kind of soil should be identified, both in descriptive terms and by type name. Local soil scientists can check such names where identifications are uncertain. For some purposes a single line drawing or pen-and-ink sketch is better than a photograph, say for illustrating the design of terraces or other structures, fertilizer placement, root growth in relation to soil structure, and the like. These should be done clearly in pencil, not in final form, so that our draftsmen and artists here can make the final drawing.

We try to get along without tables in the text. They are expensive to set, hard to fit into our narrow columns and generally unattractive. Often you can present the details in them more effectively as written matter; often they are submitted merely out of habit. Most readers skip tables. If tables are submitted, nevertheless, they must be on separate sheets by themselves, no matter how small. We cannot use what are generally called "text tables." Tables, like charts and other "art" items, are set and handled separately. Do not use phrases like Fig. 3 or See chart 6 in the text. All items -- text, charts, tables--should be self-contained, with a minimum of cross-reference.

16. Please submit with your manuscript a terse author's note that gives your name as you wish it to be printed, your position and affiliation, and a few highlights of your professional career. (See the notes in the 1952-1953 Yearbooks.)

17. Details of obtaining reprints are not handled by the editor of the Yearbook; consult your division of information regarding reprints or (if you are not in USDA) the Superintendent of Documents when the Yearbook is in print.

18. The following notes on writing are excerpts from a booklet The Publication of Research, issued by the Agricultural Research Administration in January 1945; the booklet reproduces a talk by the late Dr. E. W. Allen, who was Chief of the Office of Experiment Stations from 1915 to 1929:

The purpose of writing is not only to express ideas, but to communicate them to others. Science is not inherently dull, heavy, and hard to comprehend; it is essentially fascinating, understandable, and full of charm. It is simple, after it has been worked out, and is capable of being stated in concise terms easily understood.

But to succeed in conveying ideas correctly and in a readable way requires considerable effort on the part of most of us. It calls for time to do it well. It is just as important as making more experiments, although the worker may not like it as well, and it is quite as worthy of his best effort.

The aim in publishing research, as well as in carrying it on, is to leave the field clearer than you found it. If that cannot be done it is doubtful whether a scientific paper is justified. There cannot be clear writing without clear thinking, and when one learns to write clearly, he will in the process learn to think clearly. Indeed it may be doubted whether thought and its expression can be separated.

Clearness is absolutely essential in technical writing. It is not enough to use language that may be understood -- it is necessary to use language that cannot be misunderstood.

Having something to say, therefore, say it in your own way, provided you use good diction, the right word, and a simple form of expression.

Remember the reader. Be sympathetic toward him. He must make some effort, but he is not bound to follow you through. The writer has not the same hold on his audience that the speaker has.

Brevity is another important quality of a technical paper. This does not mean that the presentation should not be adequate to a clear understanding of what is reported and ability of the reader to judge the merits of the contribution; but the length should be proportionate to the actual contribution. Nowhere are more skill and judgment required.

The question of what to leave out will be one for very careful consideration, which frequently cannot be settled at the first writing. On review it may be found that considerable may be left out without sacrificing anything really essential. Descriptions and statements of facts gain force by brevity and by sticking quite closely to the real kernel of the subject.

As a rule, the more definitely a fact has been established by an investigation, the more directly and simply it can be presented. It is the doubtful ones that have to be hedged about with explanations, qualifications, and cautions.

The style of the technical paper should be simple, straightforward, and dignified. It should suggest neither a fairy tale, a sensational newspaper story, nor a sermon, but rather a simple, unaffected, and uncolored account of work done and its application. Accuracy and clearness ought never to be sacrificed to a supposedly more popular style. The presentation should be such as to win the reader's confidence in the thoroughness and reliability of the work reported.

NOTES ON TYPING MANUSCRIPTS

The Style Manual (1953 Revision) of the Government Printing Office governs capitalization, compounding, spelling, abbreviations, numerals, punctuation, syllabication, and plant names.

Submit to the editor the ribbon copy and the first carbon copy. The ribbon copy should be on good bond paper, not second sheets or onion skin, on which one can readily write with ink or pencil. The carbon copy, which also is used in editing (not merely for filing), must be perfectly legible. Use a fresh black ribbon. Change carbons often.

All material should be double-spaced; single spacing is not permitted anywhere -- not even in captions, at the bottoms of pages, or in the bibliography.

Do not run a paragraph over from one page to the next. Pages with runover paragraphs cannot be sent to the printer. If a paragraph is too long for one page, split it arbitrarily if necessary. Very likely it's a poor paragraph anyway if it's that long. Do not use Scotch tape for any purpose on manuscripts.

Leave about 3 inches space at the top of the first page and 1½ inches at the sides. Other pages should have 1½-inch margins at the top and sides. Don't cramp pages, please; space is needed for marking type and instructions to the printer.

The number given the manuscript in this Prospectus should appear in the upper right-hand corner of the first page.

Underscoring means italics -- use it sparingly and advisedly, and not for emphasis.

Do not staple the pages of the manuscript together. Use paper clips.

Captions for photographs go on separate sheets -- one caption only on a page. Tables, author's note, and bibliography also go on separate sheets. Do not write with hard pencil on the backs of photographs.

Indicate subheads by skipping a few lines and underlining the first few words -- three lines under letters that are capitalized and two lines under the others (to indicate small capitals). The lines may be drawn in ink.

The sample pages of manuscript that follow show a model page 1 and a later page, on which a subhead occurs.

How Insecticides Are Developed

Jacques McGillicuddy

New insecticides are developed in two ways.

The first is by determining the structure of the active principles of plants recognized as toxic to insects. Then the principles or other compounds closely related to them are synthesized -- put together again to make the whole.

The second is by testing compounds of known structure and unknown toxicity upon several species of insects and selecting the ones that are effective.

The first method starts with a material of known toxicity but unknown structure. The second starts with a compound of known structure but unknown toxic value.

In 1943 the division of insecticide investigations of the Bureau of Entomology and Plant Quarantine received from Mexico City the roots of a plant reported to be used by Mexicans as an insecticide. The plant was incorrectly labeled Erigeron affinis, but Department botanists later identified it as Heliopsis longipes. The active principle was isolated and was identified as n-isobutyl-2,6,8-decatrienamide. Three other species of the genus Heliopsis were collected in several parts of the United States and tested for insecticidal value. Laboratory tests disclosed that all the species, particularly their roots, were toxic to house flies.

(Sample manuscript, continued).

The first synthetic organic compounds used to kill insects were employed as fumigants. Carbon disulfide, made by the direct combination of carbon and sulfur, may be regarded as one of the simplest organic compounds. It was first used as an insecticide nearly 100 years ago in France. Paradichlorobenzene, originally a byproduct in the manufacture of chlorobenzene, was used as a substitute for naphthalene in combatting clothes moths in Germany in 1911

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CONDENSED OUTLINE

I. This Book and Its Background

II. Basic Principles of Soil Management

III. Principles Applied to Practices

IV. Soil Management Systems

V. Soil Management by Regions

VI. Soil Management for Special Uses

VII. Information and Assistance on Soil Management

VIII. Appendix

PART I. THIS BOOK AND ITS BACKGROUND.

1. What this book means to you and how to use it.

A short paper that explains how the book is organized and its purpose.

2. The Meaning and Importance of Soil Management.

Objectives: Economic sustained production; concept of alternative soil uses and choices; the concept of soil management systems having many parts; the objectives of soil conservation. Significance: To individual farm families, to communities, and to the National welfare. Definitions: What is included in soil management in contrast to plant management, land management, and soil conservation; concept of soil; concept of responsiveness of soil; concept of interactions; the relations of soil management to other phases of soil science and agriculture.

A brief summary in historical prospective of the development of our present knowledge about soil management beginning with early farms as going concerns and the gradual introduction of more and more technical practices into farming systems.

3. The Search for the Principles Basic to Soil Management.

This article should explain that in developing scientific principles of soil management, it is often necessary to go deeply into basic research. Something can be said of the importance and place of the "critical" experiment. It can be emphasized that science addresses itself to the question, "How much?" That is, we not only need principles in general, but we need their quantitative application. Illustrations can include atomic energy (radio-active tracers, tritium, carbon-dating); synthetic chemicals (Polyacrylites, chelates); nitrogen fixation; clay minerals; and so on.

Partly this article can be based on the assumption that farmers are interested in how basic principles are developed and what is the outlook for new things, even though they are not immediately practicable.

PART II. BASIC PRINCIPLES.

4. How Soils are Formed and How they Differ.

A discussion in simple terms of the factors and processes of soil formation that explain how soils come into being and how and why the different kinds of soil vary from one another. The explanation should indicate how soils are characterized and classified. Although the undertone of the paper needs to emphasize the relations between kinds of soil and the problems and potentialities of their management, it will be noted that detailed interpretations of local soil classificational units in terms of yields and soil management practices will be discussed in a later section. Illustrations and block diagrams might be used rather freely.

5. How Plants Grow in Soils.

As a general setting for much of the discussion that follows this article can begin with a brief review of the factors that influence plant growth. The important factors of the environment with special reference to soils. The basic requirements of an environment favorable to the roots of plants with attention to both physical and chemical requirements.

6. The physical properties of Soil in relation to Plant Growth.

A summary of the basic principles and concepts that will be elaborated in their practical details in subsequent papers: Soil texture, structure, consistence, and other physical properties of the soil. The movement of air. Soil temperature in relationship to plant cover, mulches, nutrient availability, and other dynamic processes. How the physical properties affect water penetration and water loss needs to be discussed fundamentally although these points will be elaborated in some of the other papers. It is in this paper that the definitions of soil texture and soil class will be introduced. The forms of soil structure of both natural and arable soils. The concept of bulk density and the nature of pore space. Soil depth in relation to rooting and nutrient supply. This chapter should be related specifically to principles that are related to plant growth and are important for an understanding of tillage and other management practices.

7. Soil Moisture.

The basic concepts of soil moisture forms, energy relation, soil moisture tension, and soil moisture movement. It is the purpose here to lay the basic foundation about soil-water relationships that will be elaborated in their practical details in the subsequent chapters dealing with methods and practices of water control.

8. Use of Moisture by Plants.

This basic article is intended to deal fundamentally with the requirements of plants for water. The concepts of drought resistence, water requirement; evapo-transpiration, and consumptive use. Basic principles elaborated here are those needed for the development of subsequent articles dealing with the methods and practices of water control and use, especially under irrigation and in dry areas where special practices are required to conserve moisture for efficient crop production.

9. Plant Nutrient Intake and Balance.

This chapter explains that plants require a reasonable balance among the nutrients. The nutrients will be listed and their sources - soil, water, or air - explained. How plant nutrients are held in soils, including the concept of cation exchange. How plants take in nutrients. The role of oxygen. Plant composition as it relates to nutrient intake and luxury consumption. This paper sets the stage for the several to follow on individual nutrients.

10. Soil Reaction and Calcium and Magnesium in Relation to Soil Fertility.

The nature and importance of soil reaction. It will be basic to the subsequent discussions of lime and fertilizer use and to the management of alkali soils. The relation of reaction to the availability of the other plant nutrients. The special role of calcium and magnesium in reaction control and as plant nutrients. The functions of both calcium and magnesium in plant growth; evidences of their excess or deficiency.

(Note: The next 11 articles are intended to deal fundamentally with the plant nutrients and other compounds taken in by plants. It will be noted that the more direct discussions of fertilizer materials and methods and practices for the application of fertilizers will come in subsequent papers. It is thought that these next 11 papers will lay the foundation for the applications discussed later in both the functional papers and regional papers).

11. Soil Phosphorus in Relation to Soil Fertility.

This fundamental article is intended to develop principles. Although the details of fertilizer use will be discussed later, applications to soil use and management will be necessary to make the principles clear. The following are important points to be covered: Functions and importance of phosphorus in plant growth; relations of phosphorus to other nutrients, especially magnesium and silicon; evidences of deficiency; forms and availability of phosphorus compounds; relative abundance in soils; effects of cropping and soil management practices, especially liming; effects of added phosphorus compounds in fertilizers including fixation; losses and residual effects on different kinds of soil; and accumulation of phosphorus in soils.

12. Soil Potassium in Relation to Soil Fertility.

Functions and importance of potassium in plant growth; evidences of deficiencies; the relations among potassium and other nutrients, especially magnesium and calcium, and the role of sodium in soils; the forms and availability of potassium compounds and how they are held in soils and released to plants; relative abundance of potassium in soils; the effects of cropping and soil management practices on supplies and availability; losses of potassium; the effects of added potassium compounds and their reactions in different kinds of soil; and the accumulation of potassium in unlike kinds of soil.

13. Soil Nitrogen in Relation to Soil Fertility.

The importance and function of nitrogen in plant growth. The sources of nitrogen, including organic matter and the atmosphere, need to be touched on, but the detailed discussions of organic matter and the role of microorganisms are covered in subsequent articles. Here the greatest emphasis is on the chemical compounds, including nitrogen and their relationship to plants and to other nutrients. Evidences of nitrogen deficiencies. The relative abundance of nitrogen in soils and the effect of cropping and other soil management practices, with particular emphasis on the contrast between natural soils and well-managed arable soils. How nitrogen gets into the soil, how it is held, and how it is lost. The basic effects of added nitrogen compounds.

14. Sulphur in Relation to Soil Fertility.

The importance and functions of sulphur to plant growth and its relationship to other nutrients. Plant abnormalities resulting from deficiency; the relative amounts of sulphur in soils; organic and inorganic forms; availability of forms; losses of sulphur from soils; how sulphur is added to soils naturally and through fertilizers, sprays, and in other ways; and some regional treatment to indicate areas deficient in sulphur and areas with abundant supplies.

15. Iron in Relation to Soil Fertility.

The importance and functions of iron in plant growth. The forms of iron in soils and relative availability; the problem of iron deficiency in relation to kinds of soil, areas of the country, conditions that promote it, and relations to other elements in the soil; means of supplying iron including sprays and especially the new fertilizers with the chelates; the problems of iron toxicity including the conditions under which it may exist, relations to other elements and soil properties, and means of correction; how one recognizes iron deficiency and iron toxicity.

16. Zinc in Relation to Soil Fertility.

Importance and functions of zinc in plant growth; evidences of deficiency; forms and availability of zinc compounds; relations of zinc to other nutrients; the factors causing zinc deficiency and how it may be corrected; the factors causing zinc toxicity and how it may be remedied; the use of zinc fertilizers and zinc-containing sprays; and indications of the conditions and areas of the country where excesses or deficiencies of zinc are practical problems.

17. Boron in Relation to Soil Fertility.

The importance and functions of boron in plant growth, its relations to other elements, and evidences of its deficiency. The relative demands for boron by selected important crops; forms and availability of boron compounds in soils; the kinds of soil, conditions, and areas where boron deficiencies or excesses may be expected; the materials used for correcting boron deficiency; and how boron deficiency or excess can be diagnosed.

18. Copper in Relation to Soil Fertility.

Importance and functions of copper in plant growth; evidences of deficiency or excess; relations of copper to other nutrients and compounds in soils; forms of copper in soils and its availability to plants; means of supplying copper to plants through sprays and fertilizers; and a discussion of the kinds of soil, conditions, and areas where copper can be expected to present a practical problem of soil management.

19. Manganese in Relation to Soil Fertility.

Importance and functions of manganese in plant growth; evidences of deficiency or excess; relations to other nutrients and compounds in soils; forms of manganese and their availability in soils; means of supplying manganese to plants through sprays or fertilizers; methods of correcting excesses or unbalance with other elements; the kinds of soil or soil conditions and areas where manganese is a practical problem.

20. Vanadium, Molybdenum, and Other Trace Elements in Relation to Soil Fertility.

It is intended that this article will treat both vanadium and molybdenum in somewhat the same way as suggested for iron and the other trace elements, including any suggestions of practices; it would also mention the recent work about other trace elements as a whole with perhaps special reference to chlorine and cobalt, and such additional information about plant responses, toxic effects, and the like that would be helpful and that are not already provided for in other chapters. This would seem a good place to discuss the compounds that are taken in by plants that may have no definite known functions in plant growth including those that are significant to animals. The list could include those that have toxic effects although the toxic elements will be dealt with in detail in a subsequent paper.

21. Toxic Elements in Soils.

A discussion of the more important elements that are toxic to plants or to animals that consume the plants. Perhaps selenium is the outstanding example and should deserve considerable discussion. The conditions under which selenium toxicity may be expected and measures to be taken. Arsenic may be of next importance, but the paper should consider aluminum and any other significant toxic elements. Perhaps a sketch map of the United States may be used to suggest the areas where such problems are most likely to be found, either directly or by reference to the paper on Soil Management and Crop Quality.

22. Soil Organic Matter.

A basic chapter that lays the ground work for the next one and for the group dealing with the maintenance of organic matter. The many kinds and forms of organic matter in soils and their relations to living forms and plant residues; the chemical makeup and properties of organic compounds in soils including those that result from the growth of micro-organisms; the transformations of organic matter in soils including the so-called nitrogen cycle; the basic functions of organic matter in soil including the physical effects, effects on temperature, effects on water relations, relations to reaction, as cation exchange material, as a source of plant nutrients, as a source of food for soil organisms, and as a source of complexing ions; the carbon-nitrogen ratio; and the effects that additions of fresh organic matter may have in reducing the immediate availability of phosphorus to plants.

23. Living Organisms in the Soil.

A broad discussion of the main kinds of organisms living in the soil and their role in soil fertility. Rodents, earthworms, and other animals should be included, but most emphasis should be given to bacteria and fungi. The role of organisms in nitrogen fixation, nitrification, mineralization, and other important processes. Legume bacteria and the free-living forms. It will be noted that special chapters are devoted to disease organisms, insects, and nematodes.

PART III. PRINCIPLES APPLIED TO PRACTICES

24. How to Determine the Nutrient Needs of Soil.

All the principal methods used for determining the nutrient needs including: Small pots of soil mixed with sand; biological tests with micro-organisms; pots of whole soil; plant analyses and tissue tests; nutrient deficiency symptoms of plants; soil analyses; and field plots. The conditions under which these various methods are useful; the relationships among methods, such as the correlation of chemical tests with field plot results so that they may be standardized and the use of small samples of soil in pots for inexpensive exploratory work. In the discussion of nutrient deficiency symptoms, perhaps special emphasis should be given to the problem of chlorosis because of its great importance in many parts of the country. (It is not planned to use pictures showing deficiency symptoms since reference can be made to the excellent handbook recently published in second edition by Professor T. Wallace.)

25. Soil Reaction and Liming.

This article will pick up and carry the discussion in practical terms beyond the one dealing with soil reaction and calcium and magnesium in relation to soil fertility. The great importance of liming acid soils as a basis for adequate systems of fertilization and cropping that gives sustained production should be emphasized. But the author should be mindful of the apparent difficulty of getting farmers to use sufficient amounts of lime. The following points should be included: Relation of liming needs to soil acidity, soil texture, organic matter, and clay minerals; effects practical liming practices on plant nutrients (the fundamentals are covered earlier); a discussion of optimum reaction for kinds of crops, together with variations because of different kinds of soils; different kinds of liming materials and their effectiveness, and methods of lime application. Graphs and pictures will be especially helpful. (In preparing this article the one in the 1938 Yearbook and the discussion in Efficient use of fertilizers (FAO)may be helpful.)

26. Principles of Fertilizer Use.

This paper will proceed from the previous ones and introduce the ones to follow on fertilizers in order to explain the principles basic to the use of fertilizers to supplement nutrients already in the soil in relation to the crops to be grown, to the crop sequence, and to the general level of intensity of use. Interactions among nutrients should be emphasized and illustrated with examples. One or two examples may be included of other interactions, such as water control methods and liming, although it is planned to have a specific paper later on devoted to the general principles of interactions among practices. Beginning with this ground work the paper can then proceed to the use of economic analyses of experimental results to determine the optimum application of fertilizers. The effects of price changes on the most profitable rates and illustrate the principles of capital rationing and risks as related to the use of fertilizer. Although it seems that these two aspects of fertilizer use can best be discussed in one paper, if the authors prefer two separate, but highly coordinated, papers could be used instead.

27. Trends of Fertilizer Use.

The great changes in fertilizer use in the United States, especially since 1940, together with the reasons. The significant regional differences in use should be pointed out, but the main emphasis will be on the significant changes in costs, in concentration, in kinds of materials, and in ways of using fertilizers.

28. Fertilizer Materials.

It is intended that this paper will include in tables the composition and characteristics of all fertilizers and liming materials used to any significant extent in the United States. This will be a highly important reference item to many users. The physical properties of fertilizers and the manufacture of mixed fertilizers, including those containing the micro-nutrients. The paper should also discuss the labeling of fertilizers and the State control laws.

29. Prospects for New and Better Fertilizers.

The industrial development of fertilizers, with emphasis on the prospects for cheaper and more concentrated fertilizers and for other improvements in material. The discussion will deal mainly with very new materials just entering the trade and as much as possible with promising possibilities still in the research stage.

30. Application of Fertilizers.

Practical suggestions on the methods and timing of fertilizer application and the proper placement of fertilizers. Some suggestions can be given on rates, but the author will need to indicate how rates vary with local soils, cropping systems, and economic conditions. Although sources of information will be discussed in later articles it might be well to emphasize the importance of using soil tests and of getting the most up to date suggestions from local sources. The discussion of methods should also explain some of the hazards including losses of fertilizer from washing on sloping soils. A rather full discussion of modern machinery used for the efficient and correct application and placement of fertilizers.

31. Reclamation and Management of Saline and Alkaline Soils.

The significance of the problem, including the formation of saline and alkaline soils through improper use. The practical measures that farmers can adopt. Attention will be given to variations in crops and to water quality.

32. Principles of Maintenance of Organic Matter.

This paper is intended to pick up where the more basic one left off and deal with the losses of organic matter and the principles of its maintenance. Perhaps the discussion would be built around 3 or 4 good examples from different parts of the country with supporting data. The importance of all sources of organic matter, including crop residues and green manures. How the same system of soil management may increase organic matter in one kind of soil and reduce it in another; trends in the percentage of organic matter in a soil may or may not follow trends in yields. It is expected that green manures will be discussed in more detail in a subsequent chapter and that crop residues will be dealt with some in the chapter on soil moisture conservation and in the one on cropping systems and rotations. It should be noted that separate chapters are intended to discuss manures and composts.

33. Farm Manures.

This paper will be essentially like the one in the 1938 Yearbook and appear here under the authorship of Dr. Salter.

34. Composts and Other Organic Amendments.

How to produce compost. The purpose of composting. The use of wood chips, sawdust, straw, and similar materials either for incorporation into the soil or for use as mulches. The important role of nitrogen. The relative value and use of compost, about which there is some confusion.

35. Green Manures and Cover Crops.

The use of cover crops and green manuring crops as ways to maintain organic matter; the other effects of these practices on nutrient supply, water relations, and protection of the surface soil. Perhaps a sketch map can indicate the relative importance of the various kinds of crops for these purposes in different sections of the country and tables can include rates of seeding. The conditions under which these practices give substantial benefits. Perhaps many have exaggerated ideas of their effects on increasing the organic matter in the soil.

36. Soil Management and Crop Quality.

A review of the field to bring out the effects of soil management practices on the quality of crops, with special emphasis on the nutritional quality. Perhaps small maps can be used in order to indicate the principal relationships. (These will need to be coordinated with any maps used for special elements, such as zinc, iron, and selenium).

37. Development and Maintenance of Soil Tilth.

Going beyond the basic chapter on the physical properties of soil and plant growth, this paper will explain the variations in "good" soil structure with different kinds of soil and for different cropping systems. The objectives of soil manipulation to produce desirable ... structure or tilth of arable soils, as the ground work for the chapter to follow. Emphasis should be given to structureless soils such as loose sands and massive clays, surface crusts, claypans, and hardpans. The relationship of tilth to yields and to soil management problems. Yet the reader should not be left with the idea that a high state of soil aggregation is an end in itself.

38. Tillage.

The basic principles involved in the physical manipulation of soils for optimum soil-plant relationships, including seedbed preparation, development of favorable soil for deep rooting, and residue placement. Practices that destroy soil tilth; practices that can promote it. Weed control as a function of tillage. A brief treatment of alternative methods for controlling weeds. Treatment of the optimum moisture content for tillage, the development of tillage pans, the use of minimum tillage, mulch tillage living intercrops, listing, ridge-row tillage or bedding, and similar methods should be discussed. The advantages and disadvantages of subsoiling, chiseling, and deep plowing on different kinds of soil. Perhaps a table or list can be used to outline briefly the major tillage implements and their affects on soils. It is expected that certain aspects of tillage will be dealt with in papers on runoff and erosion control and moisture conservation. But this paper should be complete on the fundamental aspects and on the machines even though there may be some duplication. This paper should be well illustrated with examples of the use of implements for surface tillage, deep tillage, listers, chisels, mulch-planters, and the like.

39. The Nature and Significance of Soil Erosion.

This is the first of a series of chapters dealing with the general subject of water management, including runoff and erosion control. Since the purpose of water control is twofold--to save the water for use in the soil and to prevent erosion--it seems best to begin with a general statement of the erosion conditions in the United States. Points to be covered include the kinds and types of water erosion; the processes of erosion; the factors responsible for soil erosion, including those that can be economically controlled and those that cannot; and the extent and significance of soil erosion in the United States. This paper should attempt to give a fair picture of the previous and existing trends with some discussion of the reasons. Perhaps a small map would be helpful and photographs should be used freely to illustrate the important kinds of situations.

40. Control of Runoff and Soil Erosion.

An explanation of the close relationship between the management of water and soil erosion in fields. The prevention of further erosion, in contrast to the reclamation and use of soils already eroded. The principal emphasis should be on the management of water for crop use rather than simply getting the water off soils in ways that prevent damage. The relations among soil use, tillage, rotations, and mechanical devices. It is thought that this paper will be primarily for operating farmers and will include specific suggestions, supplemented by drawings and pictures, on the use and construction of important kinds of terraces, and the laying out, installation, and maintenance of contouring, stripcropping, waterways, and diversions. The use and limitations of formulas relating kinds of soil, slope, and soil management practices can be illustrated briefly. The combined use of vegetative and simple structural measures in relation to

specific soil conditions. (Since there is to be a rather full discussion of water control in the Yearbook on Water, we shall not need to go into the problems of large structures and watershed management in this book. Rather, attention should be devoted to practices for controlling runoff and soil erosion within systems of management for fields. This phase of the discussion needs to be complete even though parts of it may duplicate the 1955 Yearbook.)

41. Nature and Control of Gullies.

This article is intended for farmers and similar readers to explain the methods used for controlling gullies. Since those practices used in field management will be explained in the previous article, here attention should be given to those types and kinds of gullies that need special treatment and which can be handled by ordinary good farmers with the help of local contractors. A paragraph or so should be included that explains that for very large gullies requiring extensive engineering work, the farmer will need special engineering help. Thus the main emphasis here will be on practices that farmers can adopt and they will be told how to get information for structures that are beyond the expected skill and equipment of individual farmers. It is expected that the engineering and vegetative aspects can be explained together.

42. Irrigation Methods and Practices for Arid Regions.

The principal methods of field irrigation used in those parts of the country where irrigation furnishes the chief source of water for plants. Since the 1955 Yearbook, Water, deals with this subject, we should limit ourselves here to the field practices without detail on the impoundment of water and the bringing of water to the farm. But even though there is some duplication, this Yearbook should be complete as far as field methods are concerned. In discussing the various practices, their relationships to kinds of soil and to the other soil management practices should be brought out.

43. Irrigation and Practices for Humid Regions.

The factors that a farmer needs to take into account in making the decision of whether or not to irrigate. The soil moisture levels to be sought for different crops can be covered along with the development of irrigation schedules. Practical suggestions are needed for appraising the adequacy of water sources and for methods of applying the water. Some mention shall need to be made of irrigation "guides." It is highly important that the discussion of irrigation be related to the other soil management practices that are needed to make the whole system effective.

44. Soil Drainage.

A summary of the injuries caused by poor drainage in fields including losses in efficiency of field operations, damage to crops, and restrictions in soil use. The extent of farm drainage in the United States and of the remaining problem can be covered fairly briefly. The drainage requirements of different kinds of crops. The interactions between cropping systems and drainage practices. The kinds of drainage, such as surface, subsurface, and intercepter. Controlled water tables involving both drainage and subirrigation. The designs for drainage systems in relation to soil patterns.

45. Soil Moisture Conservation.

Combinations of practices of special significance to the conservation of moisture in soils used for crops without irrigation. Rainfall conditions and variations in practices as related to climate and soil conditions. Although the paper will deal mainly with practices for moisture conservation on fields of subhumid and semiarid regions, recognition needs to be given to the application of those principles to arable soils in humid regions. Something needs to be said about fallow, the "dust mulch" theory, and the control of weeds. It will be noted that there is a subsequent paper on the control of soil blowing and it would be helpful if the authors of the two papers could exchange drafts. As there is a paper on the control of runoff and erosion, only a brief treatment of those aspects of water conservation is expected here. This paper will be more concerned with the details of losses through evaporation and weeds. Probably something should be included on the relations of fertility levels to the efficiency of moisture use.

46. Soil Movement with the Wind.

It is intended that this paper will deal basically with the mechanics of soil movement and explain the process of soil movement by wind. Also, the paper should deal with the nature, extent, and importance of this problem as it relates to kinds of soil, climate, and farming systems. It will be noted that specific practices for the control of soil blowing are described in the following paper. Photographs should be used and perhaps a small outline map to indicate the areas having greatest hazard.

47. Control of Soil Blowing (or Wind Erosion).

This paper is intended primarily for farmers seeking specific suggestions about practices for the control of soil blowing including the use of special machines, stripcropping, and other practical devices. It is thought that this paper will be analogous to the one on runoff and soil erosion. Inevitably, there is some overlap between this chapter and the one on soil moisture conservation. It is suggested that the authors should exchange drafts.

48. Stabilization of Sand Dunes.

This paper should deal specifically with the control of sand dunes. The control of soil blowing will be discussed in a previous paper. Although sand dunes are not considered cropland or even agricultural land their control is very important for the protection of other more productive land. Examples may be found along both coasts, near the Great Lakes, and in other parts of the country.

49. Soil Management and Insect Control.

The important relationships of soil management, including crop rotations and the use of surface mulches, to the incidence and control of grasshoppers, corn borers, root worms and other important insects that are in the soil.

50. Soil Management and Control of Plant Diseases.

The relationships of soil management to the incidence and control of important disease organisms in the soil, such as cotton root rot and potato scab. The significant diseases in relation to soil management practices that can be carried out by operating farmers. (It would not cover nurseries and greenhouses).

51. Soil Management and the Control of Nematodes.

The relationship of soil management practices to the control of nematodes, with special reference to field and orchard management in contrast to gardens and greenhouses. The emphasis should be on those practices carried on by farmers that favor these pests and those that help to control or eliminate them.

52. Cropping Systems and Rotations.

The basic reasons why one crop can have an effect, through the soil, upon the crop that follows. The place of crop rotations in relation to monoculture and conditions favoring one or the other. Examples to illustrate the principles for selecting suitable rotations to fit into soil management systems with the essential flexibility required on operating farms. Besides the crops themselves, attention needs to be given here to crop residue management as it relates to the rotation of crops. Because the selection of rotations is influenced by economic conditions, it seems well to treat the economic along with the soil phases in one paper. Thus the complimentary and competitive relationships among the alternatives could be treated and the effects of price changes on the profitability of alternative rotations. Although fertilizer use is treated in detail elsewhere, some aspects may need to be covered here as an important factor bearing upon crop selection. Throughout the paper the differences between short-run and long-run aspects needs to be recognized. Although it seems best to treat both the soil and economic aspects together, if the authors prefer two separate papers could be included if they were thoroughly coordinated through the exchange of drafts.

PART IV. SOIL MANAGEMENT SYSTEMS

53. Combining Practices for Efficient Soil Use.

The explanation and illustration of the principle of interactions so important in fitting together various soil management practices into a system of soil management for a field. Many of the most important developments in making soil use more efficient in terms of yields per man-day-acre have come about through taking advantages of this principle. Three or four examples could be used including corn production, pasture production in the northeast, and any one of two or three examples under irrigation in the West.

54. Soil Classification and Soil Maps.

Built partly on the earlier basic article on soils and soil classification, this one will deal with the use of the detailed classification in synthesizing and applying the results of research and experience by named kinds of soil so that specific recommendations about alternatives can be pinpointed to individual fields and farms through the use of soil maps. The paper should explain what detailed soil maps are and how and where they may be had. The central point is an explanation of the use of a soil map and to all of the information related to it for suggesting alternative recommendations, alternative kinds of adapted crops, yields of crops, and other factors of practical significance in soil management. This paper will lay the groundwork for the subsequent ones dealing with farm planning.

55. Profitability of Soil Management Systems.

A discussion, with illustrations, of the basic economic principles good farmers consider in making soil management decisions. The principles include Diminishing returns, substitution among factors and among products, the concept of complimentary and competitive relationships, the principle of equi-marginal returns, the factors of risk and uncertainty, and time as an economic variable.

56. Long-time Investments in Soil Management.

This paper should deal simply with the matter of decisions about making permanent soil improvements and with the difference between decisions for short-run outlays as contrasted to long-run outlays. Illustrations should indicate how to calculate returns from long-run improvements and should explore the possibilities of substitution between the short-run outlays and the long-run investments. The reader must be given some clues about the importance of risks in connection with long-run investments in soil management and a little about capital rationing.

57. Financing Changes in Soil Management.

The problem of financing, especially through credit, of soil management practices that require several years for realization of the full benefits. The article is intended to give guidance to farmers about this problem in terms of existing sources of credit rather than a detailed exploration of proposals for new kinds of credit institutions. In other words, it is considered as a guide within the present general situation.

58. Conservation Farm and Ranch Planning.

How one goes about developing farm plans, beginning with soil maps and their interpretation, in order to develop profitable and conserving soil management systems to fit unique patterns of soil and water resources. Emphasis should be on soil management practices. By careful selection of three or four real or hypothetical illustrations nearly all the important principles and kinds of practices can be illustrated. It is assumed that this article will deal with the development of conservation plans as they are carried out most commonly in 1956 - 1957 and not go deeply into the development of specific individual farm budgets. This later phase of farm planning will be discussed in the next article and close cooperation is necessary between the two sets of authors.

The application of production economics to the development of systems of soil management. It is intended that this paper will follow logically from the previous one and that the two sets of authors will consult. How a farmer goes about testing alternative farm plans in order to arrive at the one most profitable over a long time. The effects of changes in prices and costs. The kinds of information needed, both technical and economic, and how they are related to the individual farm problem and evaluated for development of alternative budgets. It is planned that three examples prepared to the individual authors, will show income results from alternative systems from the southeast, the midwest, and the far west and be used as a basis for much of the discussion.

PART V. SOIL MANAGEMENT BY REGIONS

60. Soil Management Regions.

This paper is intended to introduce a regional map to be used for organizing 15 regional papers on soil management systems in the United States. The paper will explain the principles used in developing the regional map and it will include definitions and descriptions of the regions on the map. Besides one map of the United States showing all the regions it is intended to have individual maps emphasizing one particular region at the head of each of the 15 regional articles that follow.

Each of the following 15 chapters will discuss soil management for some particular part of the United States. Each chapter should include a brief summary indicating the general similarities and differences of such basic features as climate, kinds of soil (mostly in general descriptive terms), crops grown, type of farming systems, potentialities for efficient soil use, and the major soil management problems such as runoff and erosion control, drainage, salinity control, improved irrigation, and the development and maintenance of soil fertility. Some regions may be so complex that they should be divided into subdivisions, mainly according to major differences in land use and soil management systems. Such subdivisions of regions may be shown on a small outline map at the head of each section. (A few are suggested on the working copy of the map for possible use by authors if they want them.) Special soil or crop situations may merit individual treatment even though the area involved cannot be conveniently identified as a subregion. Examples include muck soils, overflow land, and single culture or special rotations for special crops. It will be noted however, that some crops are dealt with in special chapters in the next major subdivision of this book. Additional joint authors or special authors for subsections may be selected by each regional author if assistance is needed to cover the assigned area adequately. Information should be given on the most significant trends or changes in soil use and soil management practices, including

resident and prospective yields and adoption of conservation practices. Emphasis should be given to the application of the available scientific findings for the improvement of soil management practices for both efficiency and conservation. It can be assumed perhaps that most readers have a fair understanding of present practices and land use, or can find such information fairly easily. In this book special emphasis should be given trends and potentialities. Any significant influence of the growth of urban centers and industry that bear directly on soil management practices should be mentioned. Further, these papers should, wherever possible, emphasize integration of all soil management practices into soil management systems so that farmers may receive the benefits of the interactions.

61. Soil Management for the North Pacific Valleys.

All agricultural areas west of the Cascade Mountains in Washington and Oregon and those west of the Coast Ranges in Del Norte and Humboldt Counties, California. Region of cool summers, mild winters, well-moistured except July-August.

62. Soil Management for the dry winter-mild region of the far west.

The Great Central Valley and all coastal valleys of California south of Humboldt County; agricultural areas of the Coachella, Imperial, Lower Colorado, Salt and Gila Valley; and the dry winter-mild portion of Texas. (This last is a distinct sub-region having summer rainfall maximum in contrast to rest of region which has most rain in winter.)

63. Soil Management for the Palouse region.

The subhumid region of non-irrigated wheat and wheat-pea farming of the Columbia Basin.

64. Soil Management for the grazing-irrigated region of the West.

The intermountain region of predominantly range grazing lands, some of it mountainous and forested, containing widely scattered but important, mostly irrigated, farming areas. Extends onto Great Plains in places where dry-farming is virtually absent.

65. Soil Management for the northern Great Plains.

Subhumid region of irregular rainfall where spring wheat and grazing predominates.

Important subregions:
SH - Nebraska Sand Hills
RR - Red River Valley
R - Predominantly Range Area
SW - Predominantly Spring Wheat Area.

66. Soil Management for the winter wheat-grazing region of the Great Plains.

The subhumid region of fertile soils but irregular rainfall in the Central and Southern Great Plains where winter wheat production predominates, plus the bluestem grazing area or Flint Hills, included here for lack of any better place.

Important subregion: FH - Flint Hills.

67. Soil Management for the Southern Plains-Crosstimbers-Blacklands.

The western subhumid portion of the non-irrigated Cotton Belt including the Great Plains cotton producing section, the Texas Blackland Cotton sections and intervening livestock and peanut areas.

Important subregions:

HP - High Plains
RB - Redbeds Plains
CT - Crosstimbers
GP - Grand Prairie
BL - Blacklands
EP - Edwards Plateau and Central Basin
KH - Katy-Hockley Soil Area
CP - Cherokee-Parsons Soil Area.

68. Soil Management for the Mississippi Delta and Coast Prairies.

The bottomlands and terraces of the lower Mississippi Valley and the coastal prairies of Louisiana and Texas, a region of warm humid climate, low elevation and relief, and widespread soil drainage problems. It contains the soils on which rice is grown, east of California.

Important subregions: P- Coast Praries D - Mississippi Delta.

69. Soil Management for the Midland Feed Region.

The great region of productive soils, gentle relief, and moderate rainfall of the Central States, where feed crops predominate and virtually all rural land is farmed.

Important subregions:

MV - Missouri Valley Loess
PW - Prairie-Wiesenboden Areas
NF - Northern Forest Margin
UM - Upper Mississippi Hilly Area.
SB - Summit-Bates Soil Area
DC - Dakota Chernozem Area
PC - Central Wisconsin Sandy (Plainfield-Coloma) Area

70. Soil Management for the Northern Lake States.

The region of cool, moist climate, and diverse, but mostly not very productive soils, in large part forested, in the Northern Lake States.

71. Soil Management for the East-Central Uplands.

The moderately warm humid region north of the Cotton Belt and south of the Midland Feed Region. It contains the Southern Appalachian and Ozark Highlands and other areas of steep slopes, as well as the nearly level lands of southern Illinois and southeastern Kansas, with their slowly permeable subsoils.

Important subregions:

AC - Allegheny-Cumberland Highlands
AV - Appalachian Valley
BG - Inner Blue Grass and Nashville Basin
BR - Blue Ridge
PD - Piedmont
CP - Cherokee-Parsons Soil Area
OZ - Ozarks
SGP - Southern Illinois Gray Prairies.

72. Soil Management for the Southeastern Uplands.

The Southeastern region of warm-humid climate with cotton the predominant type of farming, generally well-drained soils and gentle to moderate slopes.

Important subregions:

OU - Ouchita Highlands
SAV - Southern Appalachian Valleys and Ridges
LB - East-of-Delta Loess Belt
BP - Black Prairie
SP - Southern Piedmont
DC - Dewey-Decatur-Cumberland Soil Area
S - Sandhills.

73. Soil Management for the Florida Peninsula and adjacent Coastal Flatwoods.

The southeastern region of long frost-free season permitting sub-tropical crops and early season vegetables.

Important subregions:

CFU - Central Florida Uplands
EP - Everglades Peat
FW - Flatwoods

74. Soil Management for the Northeast.

The cool humid Northeastern region of cultivated valleys and uplands interspersed among rough steep or stony forested lands. Dairying generally predominates.

Important subregions:
AH - Allegheny-Catskill Highlands
NP - Northern Piedmont and Great Appalachian Valley
AP - Aroostook Potato Area
NA - Non-agricultural Areas.

75. Soil Management for the Middle Atlantic Coast.

The Atlantic Coastal Plain from Long Island to South Carolina.

Important subregion: PD - Predominantly Poorly Drained Area.

PART VI. SOIL MANAGEMENT FOR SPECIAL USES.

76. Relation of Soils to the Growth of Forest Trees.

The soil characteristics significant to the germination of tree seeds, to the survival of seedlings, and to the rate of healthy growth of trees. Significant soil characteristics that can be identified in the field and their effects in different parts of the country on natural regeneration, encroachment of brush, stand stagnation, and similar factors affecting tree production. How kinds of soil are grouped in terms of their affects on tree growth as a means for applying woodland practices on specific tracts of land. The role of soil maps for carrying such information, although their use is discussed in more detail in an earlier paper.

77. Soil Management for the Production of Forest Trees.

Soil management practices that are aimed to give increased survival of growth of naturally seeded and planted trees and to prevent development and spread of those forest diseases that depend wholly or partly on soil conditions. Methods for preparing favorable seedbeds and for eliminating competition from other plants. Those soil conditions that are unfavorable to tree growth and vigor or that are conducive to diseases should be highlighted. Examples are nutrient deficiency, poor soil structure, and impeded or excessive drainage. Diseases favored by adverse soil conditions. The emphasis in the paper is not on management of the trees, but on the management of soil for growing trees, with emphasis on the following points: Mixed species in forest stands; use of soil amendments for controlling reaction and nutrient supply; the change or control of water tables; incorporation of organic matter in preparing planting sites; and the use of

mulches and nurse crops. It may be desirable to say a little about the natural mixing of the soil through the action of roots and windthrow and with the effects of fire, but the emphasis should be on soil management practices that landowners can use.

78. Effects of Selected Forest Practices on Soil Productivity.

This paper should highlight the soil relations involved under four principal subtopics: (1) Monoculture: Data can be presented showing the relative chemical composition of coniferous and hardwood litter and the effects of these litters on the reaction, nutrient supplies, and structure of the soil. The rate of incorporation of litter should be discussed along with the value of herbaceous understories, especially legumes. Something may be said about the introduction of locust or other species on existing stands. (For part of this discussion it may be important to draw on European literature). (2) Burning: The direct effects of burning on the chemical, phusical, and biological properties of the soil should be explained with some attention to the less direct effects through changes in the compostion of the tree species and ground cover. (3) Grazing: The effects of grazing on natural soil conditions in relationship to the suitability for trees should be discussed. Probably the compaction of soil by grazing animals, increased runoff and erosion, and decreased soil moisture should be highlighted. Farmers should be given guidance as to the relative effects of different intensities of grazing and the effects under different conditions of soil and vegetation. (4) Harvesting: The importance of locating and constructing roads and skid trails in ways to avoid erosion, etc., should be explained briefly. (Warning: Avoid duplicating material in the 1955 Yearbook.)

79. Soil Management of Shelterbelts and Windbreaks.

This article should be directed almost exclusively to the soils that are not naturally or easily forested, as in the Great Plains. The paper can begin with some discussion of soil selection including the adaptability of species and general suitability of plants for windbreaks. Emphasis should be given to soil moisture relations within the windbreak, within the zone directly adjacent to the windbreak, and within the protected zone just beyond the first one. It would be helpful to summarize existing experience and data about soil moisture and special effects that this may have on the selection of crops, such as alfalfa, for areas normally too dry for alfalfa. The reader should be given specific suggestions for the establishment of shelterbelts and windbreaks including kinds of planting stock, site preparation and cultivation, and other care of the growing vegetation. The reader should be warned of any factors limiting success, but it must be remembered that many readers will go to a lot of difficulty in order to have good windbreaks. Special attention needs to be given seedlings, spacing, and orientation of field windbreaks. This problem

is most important where land is expensive and farmers do not want to use more land than is necessary for successful results. The farmer's decision will depend upon the amount of protection the farmer needs, the sources of moisture, and the seasons of the year when protection is most demanded.

80. Soil Management for Long-term Pastures.

Special combinations of soil management practices that have wide application to the establishment and maintenance of long-term (so-called permanent) pastures. Some of these pastures depend wholly on irrigation, some have a little supplemental irrigation, and many have no irrigation. It is possible to split the paper into two parts, one for the irrigated pastures of the west and one for pastures having no irrigation or only supplemental irrigation. It seems better, however, if the authors can work as a group and develop one integrated paper.

81. Soil Management on Ranges.

Soil management practices that are used to improve soil conditions for range plants, including reseeded ranges, such as fertilization, scarifying, water spreading, and the like. It is not conceived that this paper shall deal in any completeness with range management in the sense of adjusting animal units per acre during the seasons, although it is realized that such matters may come into the discussion in order to clarify the practical application of the soil management practices themselves.

82. Soil Management for Tobacco.

Soil management practices, and combinations of practices, thar are peculiar to the growing of this crop in contrast to the usual rotations. It is hoped that the significant differences between the various kinds of tobacco and between the several tobacco-growing areas can be made clear.

83. Soil Management for Orchards.

The specific soil management practices and combinations of practices that relate to the use of soils for orchards. It should be clear that the emphasis is not to be on the management of the trees, but more particularly on the soil management practices that are peculiar to orchards in contrast to the ordinary field crops grown in the same area. Something about the fact that some sloping soils that would present a serious erosion hazard for cultivated crops can be used successfully for orchards with the proper ground cover. Special practices for fertilization should be brought out. No doubt the article will need to be subdivided in order to make the suggestions reasonably specific for the several kinds of orchards such as apples, pears, pecans, and citrus.

84. Soil Management for Rice.

The soil management practices and combinations of practices that are peculiar to the production of rice in the principal rice-growing areas of the United States. It is felt that the application of the principles explained elsewhere in the book are so different for rice as contrasted to most other crops that special treatment is necessary in order to make the book useful to rice growers.

85. Soil Management for Home Gardens and Lawns.

Some of the principles already developed in terms of the relatively simple tools used in the ordinary home garden. Emphasis should be given to the great importance of soil-plant relationships in deciding about what kinds of plants to grow, especially the ornamentals, although it is not intended that complete lists with their soil requirements can be included.

PART VII. INFORMATION AND ASSISTANCE ON SOIL MANAGEMENT.

86. Research Services and Soil Management.

The purpose of this article is to explain for farmers the general organization of soil management research in the United States with the view of making it possible for farmers to find easily where they may get direct help from Federal and State research groups. Either here or in the appendix there should be included a list with addresses of the principal research stations and institutes. It also seems desirable that a simple map be included that shows the location of the State experiment stations, the principal State substations, and the principal stations, laboratories, and substations of the Department of Agriculture.

87. Educational Services on Soil Management.

The educational services available to farmers in this field, especially through the offices of county agricultural agents and State Extension specialists.

88. Technical Assistance in Soil Management.

The services available to farmers through soil conservation districts to assist them in developing effective systems of soil management. This will require some discussion of soil conservation districts and the procedures by which farmers can receive individual assistance, although it is not intended as a comprehensive discussion of the whole field of work involved in the district program.

89. Soil Testing Services.

This article should begin perhaps with a brief explanation of the purposes and use of soil tests but without repeating the more fundamental material already included. The primary aim is to make it possible for farmers and gardeners to know what to do in order to get adequate soil tests and their interpretations. Since this service is furhished in somewhat different ways in various States, doubtless a table or a list will be necessary in order to explain what arrangements are followed by the various public laboratories in the country. It should be emphasized that this service is not made available to farmers by the Department of Agriculture in Washington.

90. Financial Assistance.

An explanation of the general conditions under which farmers may receive cost-sharing public assistance. The author should be careful not to deal so specifically with current administrative details that the book becomes dated. Farmers should understand that such services exist both under cost sharing and under public credit arrangements. Obviously what is intended is a strictly factual statement describing the financial assistance services available to farmers that cannot be interpreted as any sort of "position" statement on any controversy that might arise in this area.

91. Further Reading.

This is intended as a brief statment to be prepared anonymously by the editor and committee in order to emphasize the importance to farmers of getting releases from local sources, especially from the land-grant colleges, on new or revised recommendations about fertilizers and other soil management practices. It is not intended that any specific bulletins or books will be listed here. Each author will list what seems highly desirable at the end of his own article.

PART VIII. APPENDIX

92. Special Soil Requirements of Crops.

A list of the important crops grown on farms within the United States. Opposite the name of each crop will be a paragraph of some 20 to 150 words highlighting any special soil requirements or soil management requirements for the crop, especially in relationship to the so-called "ordinary" field crops that are so prominent in our agriculture. In developing the table it may be possible to do some grouping of the crops to reduce the length of individual discussions but each crop should have at least some specific state statement and it may be generally better to list them alphabetically for easy reference. This list is intended to give the interested reader a firm start in understanding the adaptation and requirements of crops heretofore unfamiliar to him.

93. Glossary.

A list of the special terms used in the Yearbook with nontechnical definitions and explanations.